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MANAGING THE EFFECT OF INFLATION ON THE AGRICULTURAL SECTOR OF NIGERIA

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Abstract
The purpose of this study is to determine the relative effect of inflation on the agricultural sector of Nigeria over the period of 1996 - 2020 and examine how it can be managed. The Ex-post facto research design was used and the data was sourced from the Central Bank of Nigeria Statistical bulletin of various years. The E-views text was employed to analyze the data and the results show that Consumer Price Index (CPI) had a strong positive relationship with agricultural sector GDP by resulting in high positive increase in agricultural sector GDP. The results prove that some events in the country like insecurity, fuel scarcity, exodus of manufacturers etc has impacted negatively on agricultural produce and invariably the prices.
Keywords: Inflation, Agricultural sector, Nigeria, Consumer Price Index (CPI)

Introduction

One of the fundamental objectives of central monetary authorities such as the Central Bank of Nigeria (CBN) is to manage inflation, ensure price stability and maintain a strong exchange rate. This is because a very high inflation rate could have a lot of negative implications for any economy in the world. Equally, a very little inflation rate or negative inflation is not desirable. The Nigerian inflation rate has had a volatile trend, rising and falling at different intervals. The country has witnessed periods of very high inflation rates as well as periods of low inflation rates. However, since 2016, the rate of inflation in Nigeria has maintained a double-digit (Statista, 2022). Within the study period, Nigeria experienced a high rate of prices in 2017 with an inflation rate of 16.5% (Statista, 2022). This rate decreased to 12.09% in 2018 and 11.4% in 2019 but increased back to 13.25% in 2020 (Statista, 2022). This stat corroborates the volatile nature of the Nigerian exchange rate. Food price, on the other hand, has been rising in the country since food expenditure constitutes a larger share of the basket of consumer prices. On the global level, food inflation accounted for 44% of global inflation in 2007 up from 27% in 2006 (Durmus, 2008). On the supply side, the level of resources allocated for agricultural production has been dwindling for a while due to rapid urbanization and industrialization. A shift in the labour force from agricultural to non-agricultural sectors has been experienced in many developing countries- including Nigeria and more recently, the drought that hit most parts of the world has created a supply crisis, aggravating the upward trend in food prices

(Durmus, 2008). On the demand side, the huge jump in energy prices and rising environmental and political concerns force many Countries to seek alternative sources. The production and consumption of bio-fuels are increasing rapidly and thus prices of crops and commodities used for bio-fuels in the world are also increasing.

Though Nigeria depends largely on crude oil and the oil sector for the generation of its revenue, the country is still predominantly agrarian, especially in the rural areas where farming is a major income-generating source for the rural area dwellers in the country. Agriculture provides a means of livelihood for over 70% of the population and it is a major source of raw materials for the agro-allied industries, thus, it is regarded yet as the mainstay of the Nigerian economy (Okumadewa, 1997). Immediately after independence, the agricultural sector outstandingly performed these roles, to such a degree that regional development witnessed during that period was directly attributed to the sector. However, it is worthy of note that the percentage contribution of agriculture to the country's GDP has declined tremendously from 55% in 1965 to 17% in 2004, thus leading to a decline in its contribution to national development (Olatunji, Omotesho, Ayinde, and Adewumi, 2012). In fact, as of 2020, this rate stood at 24% which signifies a tremendous improvement (CBN Statistical Bulletin, 2020). According to Olatunji, Omotesho, Ayinde, and Adewumi (2012), "agricultural production in Nigeria is characterized by multitudes of small-scale farmers scattered over a wide expanse of land area, with small holdings ranging from 0.05 – 3.0 hectares, rudimentary farming system, low capitalisation, low yield per hectare, poor access to modern inputs, poor infrastructure, land/environmental degradation, inadequate research, inadequate extension services and poor response to technology adoption strategies with poor returns on investments". These small-scale farmers who produce about 85% of gross agricultural output are resource-poor and they also depend largely on the agricultural labour market.

Over the years, the agricultural sector in Nigeria has become undeniably quite strategic to national economic development, but it is faced constantly with tremendous challenges of rising food prices, seasonality in production and marketing among others. The strong links of agricultural productivity to employment, economic growth, poverty reduction and above all, macroeconomic stability has triggered more research efforts to determine the relationship between inflation, despite being an agrarian economy, Nigeria has been characterized by high food prices and inflation. This is against the expectation that in an economy where agricultural productivity is considered high, increased food abundance should exert pressure on food prices, making it possible for food prices to decline, hence a decrease in inflation. Agriculture was known to be one of the major contributors to national development, but suffering from neglect has resulted to heart-aching inflation in Nigeria. Inflation in Nigeria of the recent has been attributed to high food prices. Increasing population growth has also rendered the growth in agricultural sector insignificant resulting to a little rise in output level. This study therefore analyzed the Nigerian agricultural production and inflation rate and examines their linkage and dimension. Time series data from 1970 to 2006 were employed for this study. The analytical techniques employed are descriptive statistics and Granger Causality model. Almost 60% of household spending goes toward food. According to data from the NBS survey, total household spending in Nigeria in 2019 was N40 trillion, of which N22.7 trillion was spent on food alone.

As food prices rise beyond the means of many families with declining or stagnant household income, more people are falling into poverty. According to a World Bank estimate, there were

82.9 million poor Nigerians before inflation began to grow regularly, but that figure has increased to 90.1 million in 2021 and is expected to reach 95.1 million in 2022. The World Bank's food security update identified Nigeria as one of the nations that will experience catastrophic levels of food insecurity in 2023 (Onyedinefu, 2023). According to the National Bureau of Statistics (NBS), this is the reality in many Nigerian homes as the inflation rate reaches a 17-year high, the highest since September 2005 amid skyrocketing food prices. According to NBS data, Nigeria's headline inflation rate jumped to 21.09 percent on an annual basis in October 2022, up 5.09 percent from the 15.99 percent recorded in the same month the previous year. Prince Semiu Adeniran, the Federation's Statistician-General, lists several causes that have contributed to the yearly inflation rates rise, including disruptions in the supply of food items and higher import costs as a result of currency devaluation.

According to the National Bureau of Statistics (NBS), this is the reality in many Nigerian homes as the inflation rate reaches a 17-year high, the highest since September 2005 amid skyrocketing food prices. The data also shows that Nigeria's headline inflation rate jumped to 21.09 percent on an annual basis in October 2022, up 5.09 percent from the 15.99 percent recorded in the same month the previous year. Prince Semiu Adeniran, the Federation's Statistician-General, lists several causes that have contributed to the yearly inflation rate's rise, including disruptions in the supply of food items and higher import costs as a result of currency devaluation. The Food Security report from The World Bank states that domestic food price inflation is still very high everywhere. Nearly all low- and middle-income countries have significant inflation, according to data between June and September 2022. Therefore, the bank advised policymakers in developing nations to concentrate on the poor through social investment in Social Protection Responses to the Global Food Crisis.

In a similar vein, the International Monetary Fund (IMF) claims that severe food shortages in Nigeria is aggravating the Covid-19 pandemic's disfiguring effects on the country's most disadvantaged. The IMF stated after its routine official visit to Nigeria in November 2022 that it expects food prices to rise in Nigeria in 2023 as a result of high fertilizer prices and recent rainfall in various regions of the country (Onyedinefu, 2023). It is clear that different findings exist regarding how inflation affects overall economic growth. Even more so, the few studies on the Nigerian environment yielded a range of outcomes. There are very few studies that specifically address the influence of inflation on Nigeria's agricultural sector GDP (growth) within the time period covered by this study. This creates a significant gap in the process of agricultural growth in Nigeria and we seek to add to the ongoing debate on this topical issue and suggest relevant policy implications. This study particularly statistically measured the effect of the CPI on the GDP of the agricultural sector in order to empirically analyze how inflation has impacted the growth of the Nigerian agricultural sector from 1996 to 2020.

Review of Related Literature

Conceptual review

Concept of Inflation

One of the most commonly used expressions in economic talks is inflation, yet the idea is often misunderstood. Although there are several schools of thought on inflation, economists generally agree that inflation is a persistent increase in prices. Simply expressed, inflation is a condition in which there is a continuing overall increase in the cost of goods and services. As assessed by an indicator like the consumer price index (CPI) or the implicit price deflator for the gross national product (GNP), it could be described as a continuous rise in prices.

A common definition of inflation is a situation in which "too much money is chasing too few goods". Two terms are important to keep in mind when defining inflation. First, there is aggregate or general, which denotes that the increase in prices that constitutes inflation must apply to the entire basket of goods in the economy as opposed to a discrete increase in the price of a particular good or group of goods. The implication is that inflation cannot be said to have occurred because of changes in individual prices or in any combination of prices. However, a circumstance can develop in which a change in one price could result in an increase in the other prices. The cost of petroleum products in Nigeria is one illustration. Again, this does not indicate inflation until the price adjustment in the basket causes an increase in the level of prices overall. Second, inflation must have been ongoing in order for it to be deemed to have taken place. The overall price level must exhibit a tendency to climb steadily and consistently over time. This must be distinguished from an instance of a sudden price increase.

Consumer Price Indices (CPIs)

Consumer price Indices are index figures that track changes in the costs of products and services that households buy or otherwise get and use either directly or indirectly to fulfil their own needs and wants. CPIs can be used to track changes in either a household's cost of living (i.e., the amounts needed to maintain their standard of living) or the rate of price inflation as perceived by those households. In reality, the majority of CPIs are determined as weighted averages of the percentage price changes for a predetermined group of consumer goods, or "basket," with the weights representing their relative importance in household consumption during a specific time period. The weights' appropriateness and timeliness will have a big impact.

Concept of Food Prices

The average price of a specific food commodity both internationally and amongst nations is referred to as the "food price." Both food producers and consumers are impacted by food prices. Food costs serve as a significant measure of income, food affordability, and the equilibrium between agricultural supply and market demand. Prices for food typically benefit producers and consumers in different ways. Consumers gain from cheap food prices, as opposed to producers, who normally profit from high food prices. Abbott, Hurt, and Taylor (2008) state that "it is noteworthy that price levels are significantly affected by the food production process, including food marketing and food distribution". Geopolitical events, global demand, exchange rates, governmental policies, diseases and crop yield, energy costs, the availability of natural resources for agriculture, food speculation, changes in how soil is used, and weather events are just a few of the compounding factors that affect food prices.

Agricultural GDP

The contribution of the agriculture sector to the overall gross domestic product of the country is measured by the agricultural sector's GDP. The GDP is the total output of the various economic sectors, as was previously stated. So, the term "agricultural sector GDP" is appropriately used to refer to that portion of the GDP that is related to or arises from economic activity in the agricultural and agro-allied sector. Since the Nigerian agricultural sector includes crop production, livestock, forestry, and fisheries, it follows that the Agriculture GDP portion of the nation's overall GDP represents the sum of the outputs from these sectors.

The Nigeria Peculiar Situation

The nation being primarily an agricultural nation, however, cannot cultivate enough food for its citizens long after gaining independence and the following are four key reasons why food prices in the country have remained high (Ajulo, 2022).

Fuel Shortage

Nigeria has been dealing with significant fuel shortages in the majority of its states since February 2022. The government's plans to eliminate fuel subsidies caused fear in the fuel purchasing market last year, but it worsened when the federal government claimed that its agents had imported inferior fuel. The result was a rapid increase in food costs across the nation as drivers were obliged to charge more for the transportation of products and services.

Lack of electricity

Since the start of 2022, the nation's energy grid has shut down at least five times. This has been attributed by experts to subpar utility performance, equipment theft from the grid, bad weather, a lack of gas supply, inadequate funding, and aging grid infrastructure. In order to prevent food spoilage throughout agricultural value chains, the unreliable power supply has forced business owners (food processing and manufacturing companies) to seek out alternative but expensive means to power their tools. This has resulted in a high cost for food production, supply, and unquestionably a high cost for food on store shelves.

Russia-Ukraine crisis

The food supply chains of nations that obtain the majority of their agricultural products as well as other raw materials from both countries are currently under unprecedented stress as a result of the ongoing Russia-Ukraine crisis. Nigeria is still suffering as a result because it imports some agricultural goods from both nations and relies heavily on imports from them. Data from the United States Department of Agriculture (USDA) showed that less than 3% of Nigeria's annual consumption of about 6 million metric tons of wheat comes from domestic sources. The Nigeria Bureau of Statistics (NBS) data also shows that Nigeria imported durum wheat worth N144.14 billion in 2020 and wheat worth over N128.1 billion in the first nine months of 2021. The impacts of the ongoing Russia-Ukraine crisis are visible in the pricing of the aforementioned basic goods, with the price of bread alone increasing by almost 20% over this time. Food inflation, which makes up more than 50% of the overall inflation rate, increased to a 14-month high of 22.02 percent in July from 20.6 percent in June, according to the National Bureau of Statistics (NBS). Insecurity, high energy costs brought on by the Russia-Ukraine situation, and exchange rate depreciation were the causes of the jump, which also rose for the fifth time in a row.

Insecurity

Nigeria's recent increase in insecurity has hampered economic growth, especially in the agricultural industries. The country's northern area, where the majority of its food production occurs, is most severely affected. The more than ten-year-old Boko Haram insurgency crisis wreaking havoc on Nigeria's North-East, ethnic conflicts and banditry across the nation's North-central states have also taken a toll on the region, leaving thousands of people dead and millions of people, mostly farmers, displaced. The production of food in these areas has been

put under stress as a result. According to Ibrahim Kabiru, national President of the All Farmers Association of Nigeria, "farmers are prevented from easily accessing their farms just like any other person is because of the fear of being kidnapped." According to him, this would result in the abandonment of some crops that are already ready for harvest (Bailey, 2022). Operations manager at Aquashoot Farms, Abiodun Olorundenro, claimed that some farmers were paying bandits merely to be able to work their farms. The Armed Conflict Location & Event Data Project reports that, compared to the first half of 2010, there were approximately 1,200 kidnappings, an increase from the 45 reported in 2010 (Bailey, 2022). Mr Ikemesit Effiong, head of research at SBM Intelligence, agricultural businesses observed that the major areas where food is grown, have suspended operations as a result of the unrest (Bailey, 2022). In addition to the increase in food prices in July, the NBS reported that overall inflation in the nation continued to rise in that month, reaching 19.64 percent, the highest level since September 2005.

Exodus of Manufacturers

Dr. Muda Yusuf, chief executive officer of the Centre for the Promotion of Private Enterprise and an economist, backed up the claims of farmers by saying that industrialists who use agricultural products currently have difficulty obtaining them due to the effects of crop production instability. He claimed that some Nigerian consumers of agricultural products were now relocating to other West African nations to seek raw materials for manufacturing (Ajaja, et al, 2022). The growing insecurity in Nigeria is a significant issue for investors in the economy, according to Yusuf. Many manufacturers, particularly those in the agro-allied industry, struggle to obtain raw materials from our nation's crop-producing regions (Ajaja, et al, 2022). This has persisted in having a detrimental effect on capacity utilization, turnover, production costs, and shareholder value. Some companies increasingly purchase raw materials from nearby West African nations. The United Nations' Food and Agriculture Organization (FAO) has raised concern about the impending food crisis in Nigeria, warning that it could cause unrest. Nigeria and other nations were included as one of the 20 "hunger hotspots" where it expected that hunger would get worse in a joint FAO-World Food Programme report (Ajaja, et al, 2022).

Theoretical framework

Classical growth theory

According to the Classical idea, a nation's economic growth would slow down as its population grows and its resource base becomes more constrained. Such a postulation is a logical extension of the notion held by proponents of the classical growth theory, who contend that a short rise in real GDP per person invariably triggers a population explosion that depletes a country's resources and lowers real GDP. The nation's economic growth will consequently start to slow down. Tsegaye (2012) claims that "in classical theories, there is no direct explanation between inflation and its tax effect on profit level and output". However, the drop in firms' profit levels and savings from rising wage costs imply a negative link between the two variables (Gokal & Hanif, 2004). For the topic of this study, this theory implies that economic expansion as measured by GDP results in decreases with more resource scarcity. As a result, there will be an excess demand for the limited resources, which will eventually result in inflation and decreased output.

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Endogenous Growth Theory

According to this theory, an economy's growth is produced inside rather than externally. In essence, endogenous factors rather than exogenous forces cause economic growth. According to the hypothesis, government initiatives that increase market competition and foster product and process innovation would increase an economy's growth rate. Additionally, it asserts that private sector investment in R&D is a crucial source of technical advancement for the economy.

Empirical Review

There is a large body of empirical literature that debates whether inflation has an impact on relative farm prices. Numerous such studies have discovered a connection between changes in the relative cost of specific agricultural products and the amount of expected future inflation rates. Goodness & Nicholas (2021) used panel data from 1970 to 2019 and the dynamic panel threshold model, which takes endogeneity into account, to assess the threshold effect of inflation on agricultural growth: evidence from developing nations. The study determined a threshold for inflation of 5.997%, above which the effect of inflation on agricultural growth is negative and stronger than below the threshold. In Turkey, Caglayan & Filiztekin (2003) used panel data approaches to account for aggregate shocks as they examined the relationship between inflation and relative price variability in that nation as well as the effects of structural changes in inflation. The findings indicate that during periods of high inflation, the impact of inflation is non-neutral and less in size. Both eras of inflation and deflation saw an increase in relative price volatility. In a study on the impact of fluctuation of the price of food commodity on inflation in North Sumatera Province, Irawati *et al* 2019, examined the relationship between inflation in North Sumatera Province and changes in the price of food commodities (rice, red chilies, onions, and garlic). Robust regression was employed as the data analysis technique for this study. According to the study's findings, the commodities rice, red chilies, and onions all had positive and substantial effects on North Sumatera Province inflation, but the commodity garlic had no such significant effect. In an attempt to analyse the implications of sharply rising food prices for monetary policy in India, Moorthy &.Kolhar (2011), the findings shows that stagflation (increasing unemployment and inflation simultaneously) occurred before the increase in OPEC prices. According to the model's findings, the GDP deflator decreases in relation to the consumer price index (CPI) as food costs rise.

Methodology

Regression modeling, a condensed depiction of the relationship between two variables, was used to assess the research's assumptions. Regression modeling is used in this study primarily to objectively evaluate how much variance in the dependent variable is explained by the predictor variable. This test creates an empirical foundation on which this study's generalizations can be made. The independent variable is utilized to determine the value of the dependent variable, which is the one that will be used to make the prediction (Ugbam, 2001).

The regression model for this study is econometrically expressed thus:

$$\boldsymbol{y_i} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1 x_i} + \mu_i$$

Where:

$\boldsymbol{y_i}$ = dependent variable
$\boldsymbol{\beta_0}$ = y-intercept
$\boldsymbol{\beta_1}$ = slope coefficient
$\boldsymbol{x_i}$ = independent variable
μ_i = random error term

The linear regression model is modified thus:

$$\mathbf{AGDP} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1}\mathbf{CPI} + \mu_i$$

Other variables retain their meaning as in the general equation.

Technique

Annual time series data from 1996 to 2020 were used in the study. The Ordinary Least Square (OLS) method was used in the empirical study, and E-View was employed for the statistical computations. Additionally, an equation that calculated the influence of the independent variable on the dependent variables was created using the regression analysis.

Presentation of Data

Table 4.1: Consumer Price Index (CPI), Agricultural GDP (AGDP), and Food Inflation (FINF) data (1996-2020).

Date	**CPI**	**AGDP (N'Billion)**	**FINF**
1996	23.7	1070.51	30.5
1997	26.2	1211.46	32.79
1998	28.2	1341.04	34.21
1999	30.2	1426.97	36
2000	32.2	1508.41	30.91
2001	38.3	2015.42	39.57
2002	43.3	4251.52	44.76
2003	49.3	4585.93	47.43
2004	56.7	4935.26	54.32
2005	66.9	6032.33	66.85
2006	72.4	7513.3	70.57
2007	76.3	8551.98	71.89
2008	85.1	10100.33	83.44
2009	95.8	11625.44	95.83
2010	108.9	13048.89	109.94
2011	120.7	14037.83	121.26
2012	135.5	15816	134.95
2013	147	16816.55	148.04
2014	158.8	18018.61	162.07
2015	173.1	19636.97	178.11
2016	200.3	21,523.61	204.73
2017	233.4	23,952.55	244.75
2018	261.6	27,371.30	279.87
2019	291.4	31,904.14	318.33
2020	330	37,241.61	369.8

Source: CBN Statistical Bulletin, 2021.

Table 4.2: Descriptive Statistics of AGDP, CPI, and FINF (1996-2020)

	AGDP	CPI	FINF
Mean	12221.52	115.4120	120.4368
Median	10100.33	85.10000	83.44000
Maximum	37241.61	330.0000	369.8000
Minimum	1070.510	23.70000	30.50000
Std. Dev.	10301.30	89.06038	96.92612
Skewness	0.802878	0.967425	1.151458
Kurtosis	2.775241	2.894898	3.339289
Jarque-Bera	2.738511	3.911139	5.644310
Probability	0.254296	0.141484	0.059478
Sum	305538.0	2885.300	3010.920
Sum Sq. Dev.	2.55E+09	190362.0	225472.1
Observations	25	25	25

Source: Author's E-view 9.0 result.

Analysis of Data
The test was carried out with the aid of E-view version 9.0.

Table 4.3: Test result
Dependent Variable: AGDP
Method: Least Squares

Date: 11/16/22 Time: 08:53

Sample: 1996 2020

Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1058.346	355.4365	-2.977597	0.0067
CPI	115.0649	2.456584	46.83938	0.0000

R-squared	0.989625	Mean dependent var	12221.52
Adjusted R-squared	0.989174	S.D. dependent var	10301.30
S.E. of regression	1071.820	Akaike info criterion	16.86872
Sum squared resid	26422346	Schwarz criterion	16.96623
Log likelihood	-208.8590	Hannan-Quinn criter.	16.89577
F-statistic	2193.927	Durbin-Watson stat	0.396429
Prob(F-statistic)	0.000000		

Source: Author's E-view 9.0 result.

Table 4.3 presents the outcome of the E-view test. Following from the result we can conclude that because the independent variable (CPI) and the dependent variable (AGDP) have a positive connection with a co-efficient level of 115.0649, a unit change in the CPI will result in a change in the AGDP of N115.0649 billion. Additionally, the R-squared rate of 0.9896 demonstrates that changes in CPI can explain around 99% of the change in AGDP.

Discussions

The outcome of our tests show that Consumer Price Index had a strong positive relationship with agricultural sector GDP by resulting in high positive increase in agricultural sector GDP between 1996 and 2020. This is in line with the Malik and Chowdhury (2001) who used a Co-integration and Error Correction model to analyze data collected from four South Asian countries (Bangladesh, India, Pakistan, and Sri Lanka) and found a long run positive relationship between inflation and economic growth. Further, Barro (1997) concluded of a statistically significant relationship between economic growth and inflation in 100 countries with data from 1960 to 1990 only when high inflation experiences are included in the sample.

Summary and Recommending Practical Policy Implications

Our results suggest some practical implications for managing the situation by policy makers in Nigeria. Firstly, agriculture cannot thrive in an atmosphere of fear of losing life and property, therefore, provision of security is one of the key challenges; the Nigerian state has a constitutional obligation to do so. One of the necessary enabling environments for the private sector to enter or collaborate with the government is this one. Nigeria produces an adequate amount of reliable agricultural products; however, a large portion is lost to post-harvest waste. We can address the issue of food insecurity in the nation with careful planning that permits private sector investment further along the value chain (Ogbonnaya, 2021). Again, there must be financial support for farmers if they are really to make significant progress. Access to mechanized equipment, fertilizers, and unbiased farmer loans with low interest rates are essential. Given that the world is changing around us every day as a result of ungraded carbon depositions from industrial operations, power and water management are crucial, and farmers require regular training and retention to stay informed about the difficulties of climate change and insect invasions. There must be sufficient supply of food for food inflation to be beaten down, so the government has to develop new wholesome food brands that are affordable for common people, SMEs and MSMEs must be encouraged to innovate around the food sector scientifically. Government food subsidies play a part in maintaining low food prices (Ogbonnaya, 2021). To ensure a healthy and thriving country, government agencies continue to place a high premium on consumer protection, laws, and border and food chain enforcement.

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